

Milliken®

DeltaMax®

Performance Modifiers for Polypropylene



Milliken™

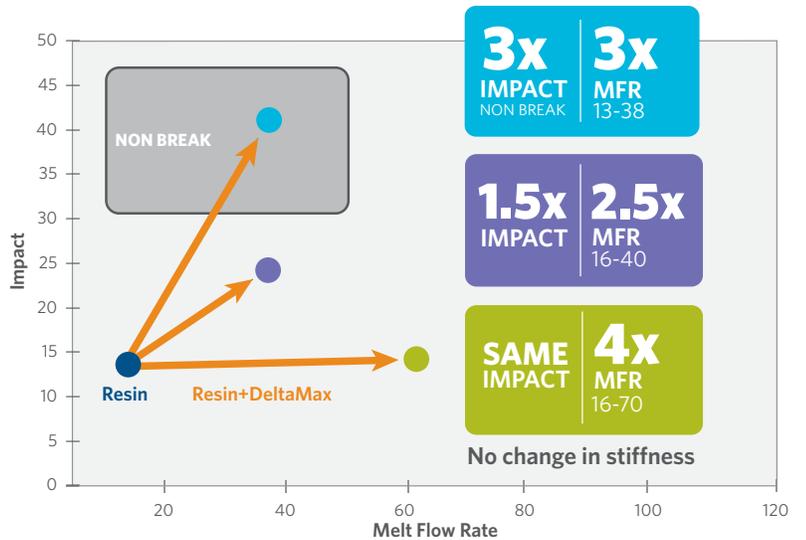
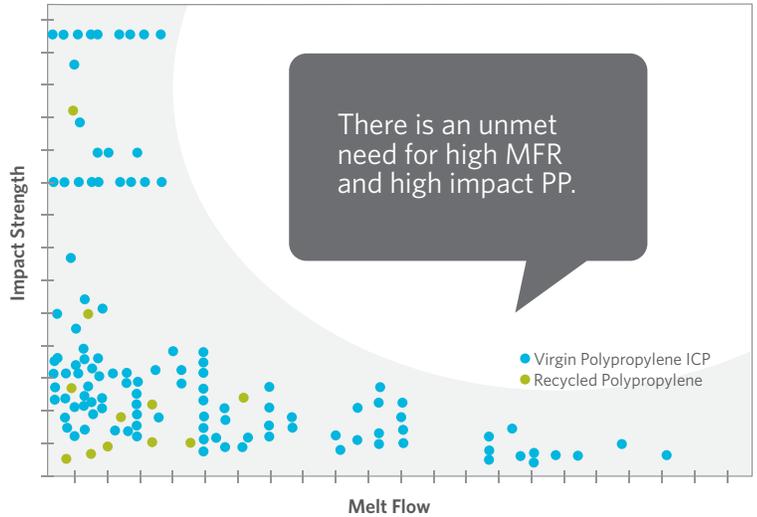
DELTAMAX[®]

Performance Modifiers for Polypropylene

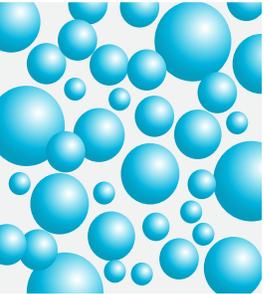
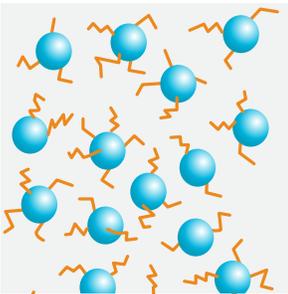
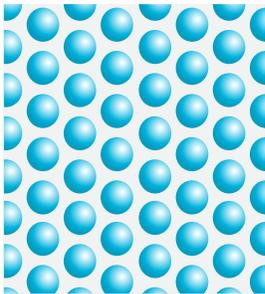
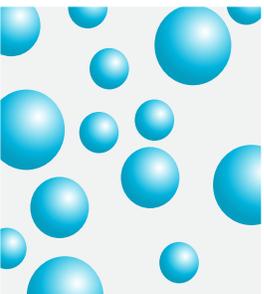
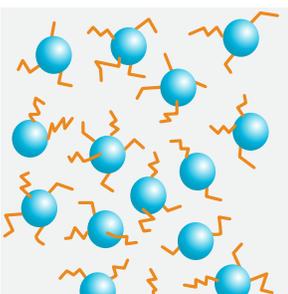
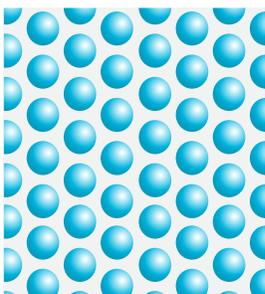
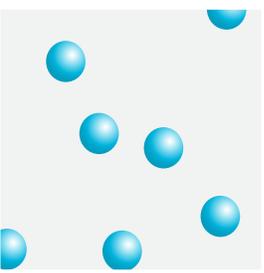
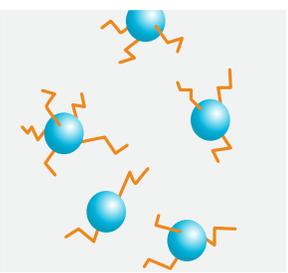
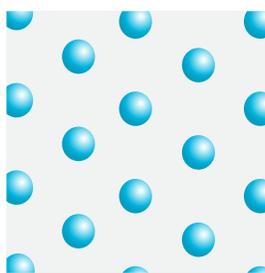
DeltaMax[®] Performance Modifiers are a family of masterbatch products designed for use in injection molded applications of virgin polypropylene impact copolymers and recycled polypropylene resins. While polypropylene is a cost-effective material, it is limited with respect to providing a balance of high impact with stiffness and melt flow making it difficult to cost-effectively formulate, design, and process parts. This is particularly the case for recycled polypropylene resins, which typically lack high melt flow and impact properties required for many injection molded applications within consumer, industrial, and automotive markets.

DeltaMax Performance Modifiers maximize the physical properties and processability of polypropylene in a way that transforms the virgin and recycled PP markets. The technology enables converters to enhance the impact and melt flow of their ICP or rPP resins by adding a masterbatch at injection molding machine-side. The net effect is the ability to design parts with higher impact and thinner profiles, run machines with faster cycle times or lower temperatures, reduce the use of costly impact modifiers, and reduce inventory of multiple ICP resins. Additionally, DeltaMax Performance Modifiers allow for the use of recycled PP at equal or better performance levels compared to virgin resins. This creates an opportunity to improve the circular economy and promotes more sustainable manufacturing practices.

DeltaMax Performance Modifiers extend the performance boundaries of PP impact copolymers



HOW IT WORKS

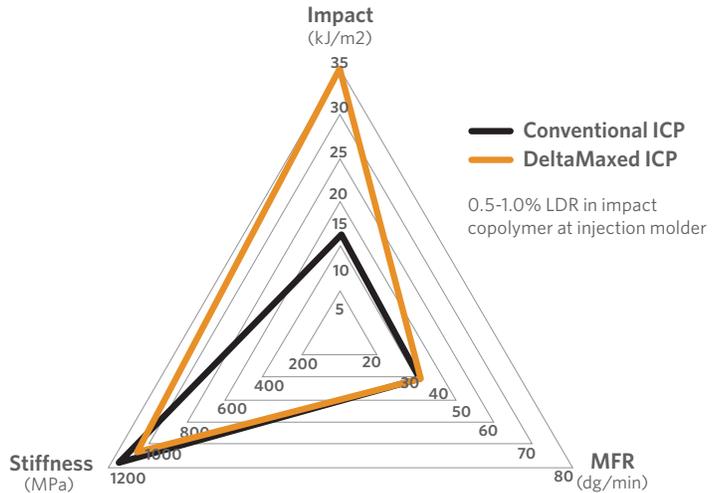
	BASE RESIN	DELTAMAX MECHANISM	NET EFFECT	RESULTING VALUE	
HIGH IMPACT ICP	 <p>High Impact ICP with ample rubber content of various domain size</p>	 <p>Branching of rubber and PP</p>	 <p>Smaller domain sizes with little change in rubber distribution.</p>	<p>Significant improvement in resin flow with no change in impact.</p>	MELTFLOW MODIFICATION
MEDIUM IMPACT ICP	 <p>Medium Impact ICP with moderate rubber content of various domain size</p>	 <p>Branching of rubber and PP</p>	 <p>Smaller, more evenly distributed rubber domains improve impact properties.</p>	<p>Higher impact, better flowing resin that is easier to process.</p>	IMPACT ENHANCEMENT
LOW IMPACT ICP	 <p>Low Impact ICP containing little rubber content</p>	 <p>Branching of rubber and PP</p>	 <p>With little rubber available, DeltaMax modifies flow properties more than impact.</p>	<p>Higher flowing resin that reduces production costs without sacrificing impact.</p>	MELTFLOW MODIFICATION

MASTERBATCHES DEFINED



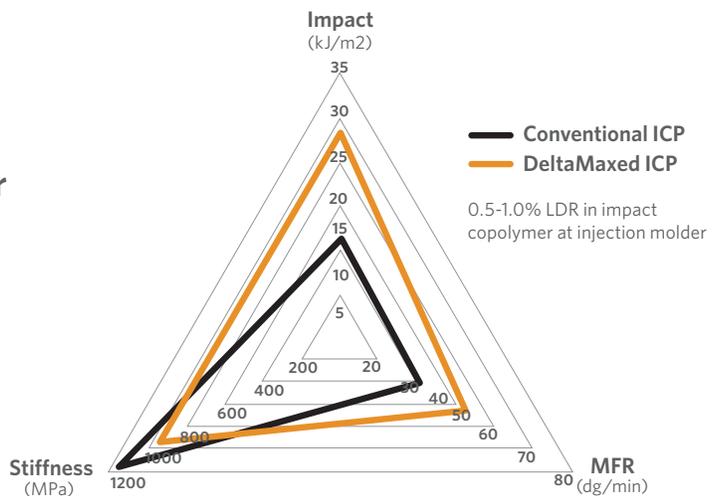
DeltaMax™ i300 Impact Enhancer

DeltaMax™ i300 is a high performance impact enhancer designed for use in injection molded applications of polypropylene impact copolymers and recycled polypropylene resins. DeltaMax i300 maximizes impact performance while optimizing melt flow rate (MFR) for improved physical properties and processability of polypropylene.



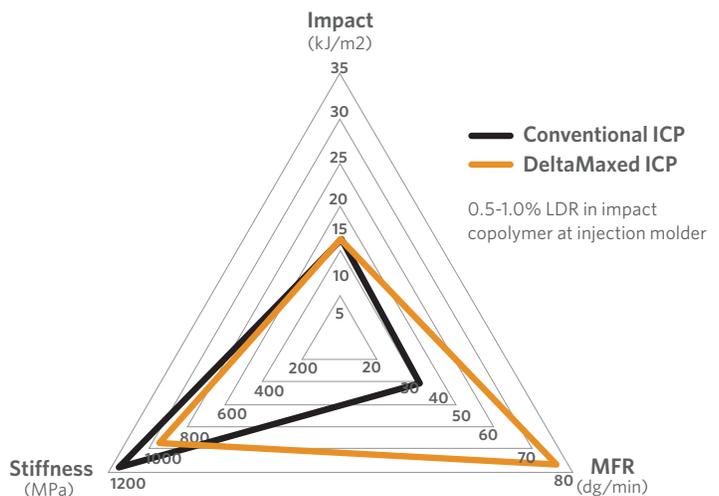
DeltaMax™ a200 All Purpose Modifier

DeltaMax™ a200 is a high performance impact and melt flow modifier designed for use in injection molded applications of polypropylene impact copolymers and recycled polypropylene resins. DeltaMax a200 provides a strong balance of impact, stiffness, and melt flow rate (MFR) to maximize the physical properties and processability of polypropylene.



DeltaMax™ m100 Melt Flow Modifier

DeltaMax™ m100 is a high performance melt flow modifier designed for use in injection molded applications of polypropylene impact copolymers and recycled polypropylene resins. DeltaMax m100 increases the melt flow rate (MFR) while providing equal or better impact performance to maximize the physical properties and processability of polypropylene.



CASE STUDIES



Maximize Impact Properties

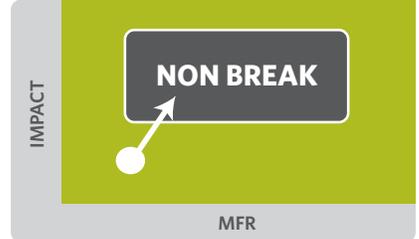
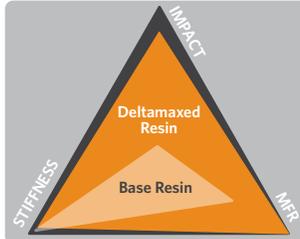
An industrial bucket and pail manufacturer is attempting to formulate a high impact, non break solution for a leading retailer.



IMPACT FROM
13 TO 43
3X
IMPROVEMENT
IN IMPACT

MFR FROM
17-30 | **2X**
IMPROVEMENT
IN MFR

STIFFNESS FROM **830-800**
MINIMAL CHANGE IN STIFFNESS



Maximize Melt Flow Properties

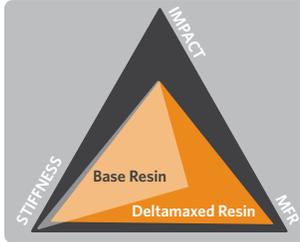
A housewares manufacturer must reduce production costs by optimizing operating efficiencies and increasing processing speeds.



DECREASED
MOLDING
TEMPERATURE
6%
FROM **425°F**
TO **400°F**

IMPROVED COST SAVINGS/
PROFIT IMPROVEMENT
\$ \$190/T

CYCLE TIME
REDUCTION **11%**



Maximized Sustainability

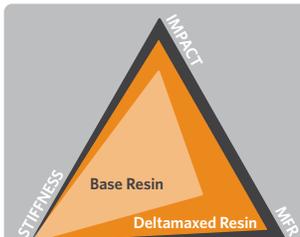
Based on a new sustainability initiative, a leading housewares manufacturer has been tasked with increasing the amount of recycled plastics being used without sacrificing physical properties.



IMPACT FROM
75 TO 91
20%
IMPROVEMENT
IN IMPACT

MFR FROM
11-26 | **2.5X**
IMPROVEMENT
IN MFR

STIFFNESS FROM **1176-1090**
MINIMAL CHANGE IN STIFFNESS



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for Polypropylene

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05.12.2021

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